

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A method for forming a diffractive lens, comprising:

forming a stack comprising above a first surface of a transparent substrate, the stack comprising at least two phase shifting layers separated by an etch stop layer ~~above a first surface of a transparent substrate~~, the transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet; and

patterning the stack to form layers of a diffractive optical element; and

bonding a bonding ring to the first surface of the transparent substrate around the diffractive optical element.

Claim 2 (original): The method of claim 1, wherein the transparent substrate comprises a material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 3 (currently amended): The method of claim 1, wherein said forming a stack comprises:

(1) depositing a first phase shifting layer comprising a material selected from the group consisting of amorphous silicon and silicon nitride;

(2) growing ~~an~~ the etch stop layer comprising silicon dioxide on the first phase shifting layer; and

(3) depositing a second phase shifting layer comprising the material on the etch stop layer.

Claim 4 (original): The method of claim 1, further comprising forming an opaque coating on a second surface of the substrate.

Claim 5 (original): The method of claim 4, wherein the opaque coating comprises amorphous silicon.

Claim 6 (original): The method of claim 1, further comprising, prior to said forming a stack:

forming an antireflective coating on the first surface of the transparent substrate, wherein the stack is formed on the antireflective coating.

Claim 7 (original): The method of claim 1, further comprising, subsequent to said patterning the stack:

forming an antireflective coating over the diffractive optical element.

Claim 8 (canceled).

Claim 9 (currently amended): The method of claim [[8]] 1, wherein said bonding comprises ~~forming a bond between the bonding ring and the transparent substrate~~ selected from the group consisting of an anodic bond, an adhesive bond, a hydrofluoric acid bond, and a glass frit bond.

Claim 10 (currently amended): The method of claim [[8]] 1, further comprising bonding a submount to the bonding ring to form a package.

Claim 11 (currently amended): A method for forming a diffractive lens, comprising:

forming a stack comprising above a first surface of a transparent substrate, the stack comprising at least two phase shifting layers separated by an etch stop layer, the transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet;

patterning the stack to form layers of a diffractive optical element; and

~~The method of claim 1, further comprising~~ bonding a submount to the first surface of the transparent substrate with silicone.

Claim 12 (currently amended): A method for forming a diffractive lens, comprising:

providing a silicon-on-insulator (SOI) substrate comprising a transparent device layer, an insulator layer below the device layer, and a handle layer below the insulator layer, the transparent device layer being transmissive to a light wavelength selected from infrared to ultraviolet;

forming a stack above the transparent device layer, the stack comprising at least two phase shifting layers separated by an etch stop layer;

patterning the stack to form layers of a diffractive optical element; and

~~The method of claim 1, wherein the transparent substrate comprises a device layer of a silicon-on-insulator (SOI) substrate, the SOI substrate further comprising an insulator layer below the device layer and a handle layer below the insulator layer, the method further comprising:~~

etching the handle layer to the insulator layer to remove a portion of the handle layer opposite the diffractive optical element, wherein the remaining portion of the handle layer forms a bonding ring.

Claim 13 (original): The method of claim 12, further comprising:

etching the insulator layer to remove a portion of the insulator layer opposite the diffractive optical element.

Claim 14 (currently amended): The method of claim 13, further comprising:

forming an antireflective coating on a second surface of the transparent device layer opposite the diffractive optical element.

Claim 15 (original): The method of claim 12, further comprising:

forming a bonding pad on the bonding ring.

Claim 16 (original): The method of claim 12, further comprising:

forming a planarization layer over the diffractive optical element; and
planarizing the planarization layer.

Claim 17 (original): The method of claim 16, further comprising:

forming an antireflective layer on the planarization layer.

Claim 18 (currently amended): A diffractive lens, comprising:

a transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet; and

a diffractive optical element above a first surface of the transparent substrate, the diffractive optical element comprising at least two phase shifting layers separated by an etch stop layer; and

a bonding ring bonded to the first surface of the transparent substrate around the diffractive optical element.

Claim 19 (original): The lens of claim 18, wherein the transparent substrate comprises a material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 20 (original): The lens of claim 18, further comprising an opaque coating on a second surface of the substrate.

Claim 21 (original): The lens of claim 20, wherein the opaque coating comprises amorphous silicon.

Claim 22 (original): The lens of claim 18, further comprising:

an antireflective coating between the first surface of the transparent substrate and the diffractive optical element.

Claim 23 (original): The lens of claim 18, further comprising:

an antireflective coating over the diffractive optical element.

Claim 24 (canceled).

Claim 25 (currently amended): The lens of claim [[24]] 18, wherein the bonding ring is bonded to the transparent substrate by a bond selected from the group consisting of an anodic bond, an adhesive bond, a hydrofluoric acid bond, and a glass frit bond.

Claim 26 (original): The lens of claim 18, further comprising:

a submount bonded to the bonding ring to form a package.

Claim 27 (currently amended): A diffractive lens, comprising:

a transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet;

a diffractive optical element above a first surface of the transparent substrate, the diffractive optical element comprising at least two phase shifting layers separated by an etch stop layer; and

The lens of claim 18, further comprising:

a submount bonded to the first surface of the transparent substrate with silicone.

Claim 28 (currently amended): A diffractive lens, comprising:

a silicon-on-insulator (SOI) substrate comprising a transparent device layer, an insulator layer below the device layer, and a handle layer below the insulator layer, the transparent device layer being transmissive to a light wavelength selected from infrared to ultraviolet,

~~The lens of claim 18, wherein the transparent substrate comprises a device layer of a silicon-on-insulator (SOI) substrate, the SOI substrate further comprising an insulator layer below the device layer and a handle layer below the insulator layer, the handle layer being etched so the remaining portion of the handle layer forms a bonding ring;~~

a diffractive optical element above a first surface of the transparent device layer, the diffractive optical element comprising at least two phase shifting layers separated by an etch stop layer.

Claim 29 (currently amended): The lens of claim 28, further comprising:

an antireflective coating on a second surface of the transparent device layer opposite the diffractive optical element.

Claim 30 (original): The lens of claim 28, further comprising:

a bonding pad on the bonding ring.

Claim 31 (original): The lens of claim 28, further comprising:

a planarization layer over the diffractive optical element.

Claim 32 (currently amended): The lens of claim ~~[[28]]~~ 31, further comprising:

an antireflective layer over the planarization layer.

Claim 33 (original): A method for forming a diffractive lens, comprising:

forming an etch stop layer on a first surface of a silicon substrate;

forming a diffractive optical element above the etch stop layer;

forming a planarization layer over the diffractive optical element;

planarizing the planarization layer;

~~bonding a transparent substrate to the planarization layer; the transparent substrate being~~
transmissive to a light wavelength selected from infrared to ultraviolet; and

etching a second surface of the silicon substrate to the etch stop layer to remove at least a
portion of the silicon substrate opposite the diffractive optical element.

Claim 34 (original): The method of claim 33, wherein the transparent substrate comprises a
material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 35 (currently amended): The method of claim 33, wherein said forming a diffractive optical
element comprises:

forming a stack comprising at least two phase shifting layers separated by another etch
stop layer ~~above~~; and

patterning the stack to form layers of the diffractive optical element.

Claim 36 (original): The method of claim 33, wherein said bonding a transparent substrate to the
planarization layer comprises:

forming a bonding layer on the planarization layer; and

bonding the transparent substrate on the bonding layer by an anodic bond.

Claim 37 (original): The method of claim 33, further comprising, prior to said forming a
diffractive optical element:

~~forming an antireflective layer on the etch stop layer, wherein the diffractive optical~~
element is formed on the antireflective layer.

Claim 38 (original): The method of claim 37, further comprising:

etching the etch stop layer to remove a portion of the etch stop layer opposite the
diffractive optical element.

Claim 39 (original): The method of claim 33, wherein the remaining portion of the silicon
substrate forms a bonding ring.

Claim 40 (original): The method of claim 39, further comprising:

forming a bonding pad on the bonding ring.

Claim 41 (original): The method of claim 39, further comprising:

bonding a submount to the bonding ring to form a package.

Claim 42 (original): The method of claim 33, wherein said etching a second surface of the silicon substrate further comprises removing all of the silicon substrate.

Claim 43 (original): A diffractive lens, comprising:

a transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet;

a planarization layer below the transparent substrate;

a diffractive optical element below the planarization layer; and

an etch stop layer below the diffractive optical element.

Claim 44 (original): The diffractive lens of claim 43, wherein the transparent substrate comprises a material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 45 (original): The diffractive lens of claim 43, wherein the diffractive optical element comprises at least two phase shifting layers separated by another etch stop layer.

Claim 46 (original): The diffractive lens of claim 43, further comprising:

a bonding layer between the transparent substrate and the planarization layer.

Claim 47 (original): The diffractive lens of claim 43, further comprising:

an antireflective layer between the etch stop layer and the diffractive optical element.

Claim 48 (original): The diffractive lens of claim 43, further comprising:

a bonding ring below the etch stop layer.

Claim 49 (original): The diffractive lens of claim 48, further comprising:

a bonding pad on the bonding ring.

Claim 50 (original): The diffractive lens of claim 48, further comprising:

a submount bonded to the bonding ring to form a package.

Claim 51 (original): A method for forming a diffractive lens, comprising:

forming a mold for a diffractive optical element on a first surface of a silicon substrate;

forming a lens layer above the mold, wherein the lens layer conforms to the mold to form the diffractive optical element, the lens layer being transmissive to a light wavelength selected from infrared to ultraviolet;

planarizing the lens layer;

bonding a transparent substrate to the lens layer; and

etching a second surface of the silicon substrate opposite of the diffractive optical element, wherein the remaining portion of the silicon substrate forms a bonding ring.

Claim 52 (original): The method of claim 51, further comprising, prior to said forming a lens layer above the mold:

forming an etch stop layer on the mold; and

wherein the lens layer is formed on the etch stop layer and said etching a second surface of the silicon substrate comprises etching the silicon substrate to the etch stop layer.

Claim 53 (original): The method of claim 51, wherein the lens layer comprises a material selected from the group consisting of silicon nitride and silicon dioxide.

Claim 54 (original): The method of claim 51, wherein the transparent substrate comprises a material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 55 (currently amended): The method of claim 51, wherein said forming a mold comprises:

forming a stack comprising at least two lens layers separated by an etch stop layer; and

patterning the stack to form layers of the mold for the diffractive optical element.

Claim 56 (original): The method of claim 51, further comprising:

forming a bonding pad on the bonding ring.

Claim 57 (original): The method of claim 51, further comprising bonding a submount to the bonding ring to form a package.

Claim 58 (original): A diffractive lens, comprising:

a transparent substrate being transmissive to a light wavelength selected from infrared to ultraviolet;

a diffractive optical element below the transparent substrate; and

a bonding ring below the diffractive optical element.

Claim 59 (original): The diffractive lens of claim 58, further comprising:

an etch stop layer between the diffractive optical element and the bond ring.

Claim 60 (original): The diffractive lens of claim 58, wherein the diffractive optical element comprises a material selected from the group consisting of silicon nitride and silicon dioxide.

Claim 61 (original): The diffractive lens of claim 58, wherein the transparent substrate comprises a material selected from the group consisting of quartz, Pyrex, and sapphire.

Claim 62 (original): The diffractive lens of claim 58, further comprising:

a bonding pad on the bonding ring.

Claim 63 (original): The diffractive lens of claim 58, further comprising:

a submount bonded to the bonding ring to form a package.